



MARKSCHEME

MAY 1999

BIOLOGY

Higher Level

Paper 3

Option D — Evolution

- D1.** (a) (i) *(Award 2 marks. For a comparison giving relative predation award 1 mark)*
many green/yellow snails eaten initially but fewer later;
few banded snails eaten initially, but more later;
- (ii) *(Award 2 marks maximum)*
few eaten at start because brown less visible / background is brown / more eaten later because more visible / background becomes continuous green;
more eaten later as fewer yellow ones available as alternative food;
- (b) (i) *(Award 1 mark. Award no marks for answering 'yes' only.)*
they do interbreed because they are the same species;
- (ii) *(Award 2 marks maximum)*
each has a selective advantage at different times;
approximately equal numbers survive after 20 days;
background colour of habitat may vary;
as they decrease in numbers, so does the number of predators;
predator less likely to search for a form when it is rare;
- D2.** (a) *(Award 1 mark)*
Prokaryotes / Monera / Bacteria
- (b) (i) *(Award 1 mark)*
Mitochondrion
- (iii) *(Award 1 mark)*
Any three of: fungi, protocista, protista, animals and plants;
- D3.** (a) *(Award 6 marks maximum)*
Homologous structures are various different structures of the same basic plan;
Derived from a similar embryonic origin;
Variations on the basic structure allow different functions;
Permitting exploitation of different ways of life / adaptive radiation;
This suggests divergence from a common ancestor;
Named example of a homologous structure (e.g. pentadactyle limb, flower, birds' beaks);
Description of basic structure of this example;
Variations related to different functions of this example;
- (b) *(Award 4 marks maximum. If a list of adaptations only is given award 3 marks maximum)*
grasping limbs / fingerprints / fingerpads / nails;
needed for grasping / holding on to / climbing trees (branches);
rotating forelimb / shoulder blade (scapula) on back of thorax / free wrist movement;
needed for reaching in many directions;
well developed clavicle;
allows hanging from arms / arms support the weight of the body;
stereoscopic / binocular vision;
to judge distances;

Option E —Neurobiology and Behaviour

- E1. (a)** *(Award 6 marks maximum)*
 excitatory drugs increase synaptic transmission;
 named example *e.g.* nicotine, caffeine, cocaine/crack, amphetamines/MDMA/ecstasy;
 some drugs mimic the neurotransmitter;
 some drugs inhibit the enzyme that breaks down neurotransmitter;
 inhibitory drugs decrease synaptic transmission;
 named example *e.g.* Valium / Temazepam / benzodiazepines / cannabis;
 some drugs block receptors preventing neurotransmitters binding to them;
 some drugs inhibit release of neurotransmitters;
- (b)** *(Award 4 marks maximum)*
 brain damage;
 cirrhosis of liver / causes permanent liver damage;
 smaller babies;
 increased reaction time / increased chance of traffic accidents;
 damage to pancreas;
 lower inhibitions / increased violence;
 addiction;
 financial / family / social problems;
- E2. (a)** *(Award 2 marks)*
 receptor protein;
 each receptor protein has complementary shape to fit shape of odorant;
- (b)** *(Award 3 marks maximum)*
 G protein activates the enzyme adenylyl cyclase;
 enzyme converts ATP to cAMP;
 cAMP causes calcium channel to open;
 calcium causes chloride channel to open;
- (c)** *(Award 1 mark)*
 membrane of chemoreceptor cell depolarises / hyperpolarises / an action potential is created;
- E3. (a)** *(Award 2 marks maximum)*
movement of organism in response to a stimulus;
rate but not direction of movement affected by the size of stimulus;
- (b)** *(Award 2 marks maximum)*
 wood lice move more in dry conditions;
 better chance of finding damp area;
- or other suitable example marked in the same way.*

Option F — Applied Plant and Animal Science

- F1. (a) *(Award 2 marks)*
yield rose throughout the period;
greater increases over every ten years until 1980 to 1990;
- (b) (i) *(Award 1 mark)*
21 / 21.4;
- (ii) *(Award 2 marks maximum)*
crop rotation used in 1940 but not in 1990;
fields never left fallow / never used for legumes in 1990;
monoculture of wheat involves more fertiliser input;
manure not used in 1990;
fewer nitrogen fixing bacteria in soil in 1990;
- (c) *(no mark given for the prediction, award 2 marks maximum for the reasons for the prediction given)*
- either*
not higher because
diminishing returns from extra inputs;
fears about nitrogen leaching;
conversion to organic methods;
- or*
higher because
more wheat needed for growing population;
plateau of wheat yield not yet reached;
extra cost of fertiliser less than value of extra wheat yield;
- F2. (a) *(Award 1 mark)*
auxin / gibberelin / cytokinin / ethene (ethylene) / ABA / other example;
- (b) *(Award 2 marks maximum)*
selective herbicides to kill broad-leaved weeds;
production of fruits without seeds;
induction of flowering at any time of year;
promoting rooting of cuttings / cloning from tissue cultures;
dwarfing of stem growth;
delay / promote ripening;

F3. (a) *(Award 6 marks maximum)*

rapid increase in world population;
shortage of agricultural land;
pests / disease of crops;
soil erosion / salination;
natural disaster / drought / floods / earthquakes;
poverty / too poor to import food / unequal distribution of food across the world;
political e.g. trade embargo;
governments using land for profitable cash crops;
lack of technology / poor agricultural methods;
exhaustion of natural resources / fish stocks;
lack of education in what constitutes a balanced diet;

(b) *(Award 4 marks maximum)*

meat eating involves killing animals / religious dogma may not permit killing of animals;
suffering of animals in captivity;
milk products obtained do not involve killing cow;
cow and calf suffer when separated soon after birth;
cow only produces milk after calving and calf eventually killed;
employment for farm and food industry workers;
humans are adapted to eat meat;
more food available if vegetables eaten instead of meat;

Option G — Ecology and Conservation

- G1. (a)** *(Award 1 mark for each of the following to a maximum of 5)*
burn less coal / fossil fuels;
burn low sulfur coal;
flue gas desulfurisation;
use energy saving measures;
use alternative energy sources / wind / solar / nuclear / other;
spread lime on lakes to neutralise acids;

(Award 1 marks for the point below)
reference to relative merits of above methods;

- (b) *(Award 4 marks maximum)*
only found in bacteria / prokaryotes;
light not required;
chemical reactions used as energy source;
inorganic substances oxidised;
e.g. hydrogen sulfide / ammonia / nitrite / sulfur;
ATP produced;
organic substances / food produced;

- G2. (a) (i)** *(Award 1 mark)*
June;

- (ii) *(Award 1 mark)*
July;

- (b) (i) *(Award 1 mark)*
L. triangularis in July;

- (ii) *(Award 1 mark)*
because there are no competitors;

- (c) (i) *(Award 2 marks)*
they build webs at different heights;
they reproduce / build webs at different times of the year;

- G3. (a)** *(Award 2 marks)*
everglades kite / passenger pigeon / dodo / ivory-billed woodpecker / other verified specific example;
New Zealand mistletoe / Dominican wine palm;

- (b) *(Award 2 marks. If species given in part (a) is not known to be extinct no points can be awarded in part (b))*
hunting / destruction of habitat;
loss of habitat / deforestation / extinction of pollinator;

Option H —Further Human Physiology

H1. *(Award 6 marks maximum for this question)*

	Structure	Function
I.	RER;	synthesis of trypsin / trypsinogen;
II.	remains of a vesicle;	site of exocytosis / secretion;
III.	vesicle;	storage of trypsin / trypsinogen;

H2. (a) *(Award 2 marks maximum)*

amylase;
mucus;
lysozyme / enzyme to kill bacteria;
mineral salts / chloride / sodium / hydrogen carbonate;
antibodies

(b) *(Award 2 marks)*

(wall of) stomach;
(wall of) small intestine or specific region / Brunner's glands / Crypts of Leiberkuhn;
liver (but not gall bladder);

H3. (a) *(Award 6 marks maximum)*

internal intercostal muscles contract, causes ribs to move down and in;
external intercostal muscles relax, rib cage falls;
elastic tissue of lungs recoils;
muscles of abdomen wall contract;
causing diaphragm to be pushed up;
volume of thorax reduced;
air pressure in thorax higher than air pressure;
air exhaled until pressures are equal;
air flows through bronchioles, bronchi, trachea;

(b) *(Award 4 marks maximum)*

head of patient tipped back;
airway cleared;
nose pinched;
mouth placed against patients mouth / air breathed into patients lungs;
breathing about once every 7 to 8 seconds;
continue until patient starts to breath independently;